Maritime and Coastguard Agency

The UK Strategy & Response to the Use of Dispersants at Sea

Clean California Conference

September 2005

1. A resume of incident response
2. The regulatory process for dispersants
3. Contingency planning arrangements
4. Command and control
5. Research & development
6. Future trends and drivers
7. Summary

Toby Stone
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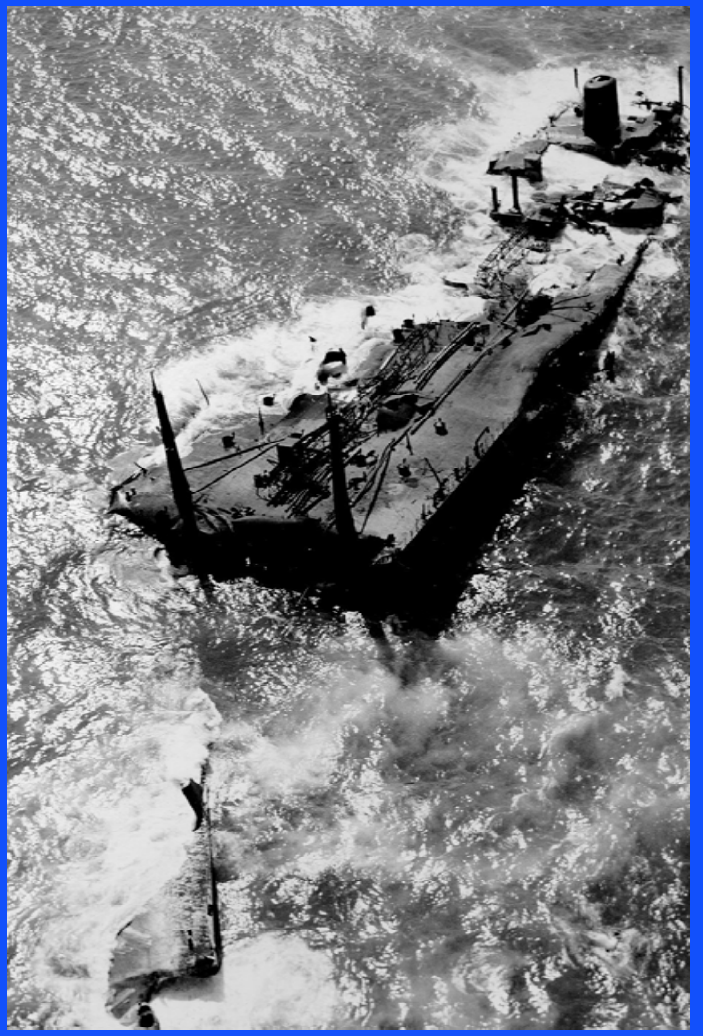
United Kingdom
Maritime & Coastguard Agency

The Top Twenty

Atlantic Express	1979	off Tobago, West Indies	287,000
ABT Summer	1991	700 nm off Angola	260,000
Castillo de Bellver	1983	off Saldanha Bay, South Africa	252,000
Amoco Cadiz	1978	off Brittany, France	223,000
Haven	1991	Genoa, Italy	144,000
Odyssey	1988	700 nm off Novia Scotia, Canada	132,000
Torrey Canyon	**1967**	**Scilly Isles, UK**	**119,000**
Urquiola	1976	La Coruna, Spain	100,000
Hawaiian Patriot	1977	300 nm off Honolulu	95,000
Independenta	1979	Bosphorus, Turkey	95,000
Jakob Maersk	1975	Oporto, Portugal	88,000
Braer	**1993**	**Shetland Isles, UK**	**85,000**
Khark 5	1989	120 nm Atlantic Coast, Morocco	80,000
Aegean Sea	1992	La Coruna, Spain	74,000
Sea Empress	**1996**	**Milford Haven, UK**	**72,000**
Katina P.	1992	off Maputo, Mozambique	72,000
Assimi	1983	55 nm off Muscat, Oman	53,000
Metula	1974	Magellan Straits, Chile	50,000
Wafra	1971	off Cape Aghulas, South Africa	40,000
Exxon Valdez	1989	Prince William Sound, Alaska, USA	37,000


TORREY CANYON
ROYAL NAVY
B
N



International Convention on Oil Pollution Preparedness, Response and Co-operation 1990

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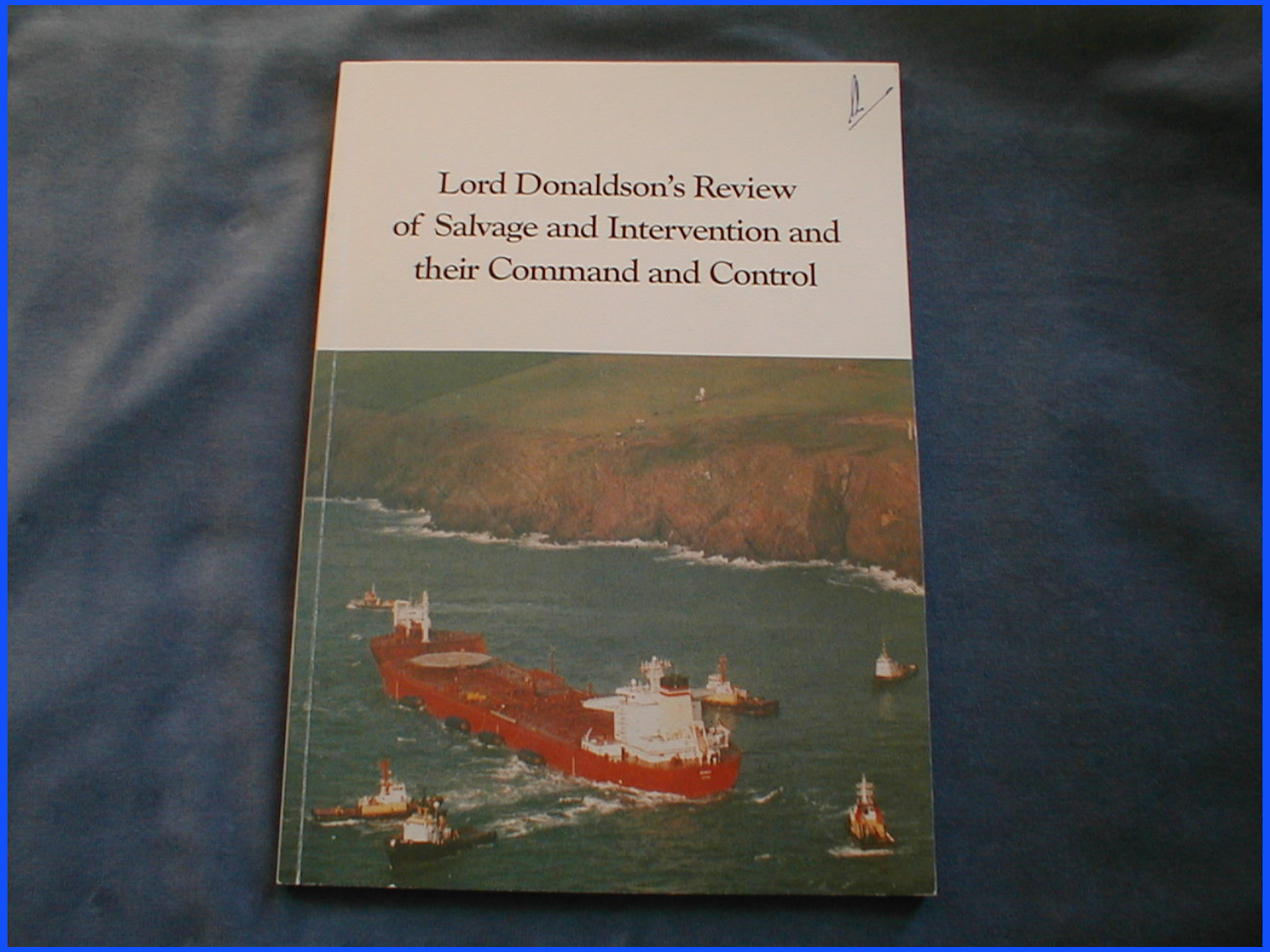

Lord Donaldson's Review
of Salvage and Intervention and
their Command and Control

Lord Donaldson's Review Of Command, Control, Salvage and Intervention

Four conclusions fundamental to the report:

1) The involvement of Ministers in Operational decisions is not a practicable option;

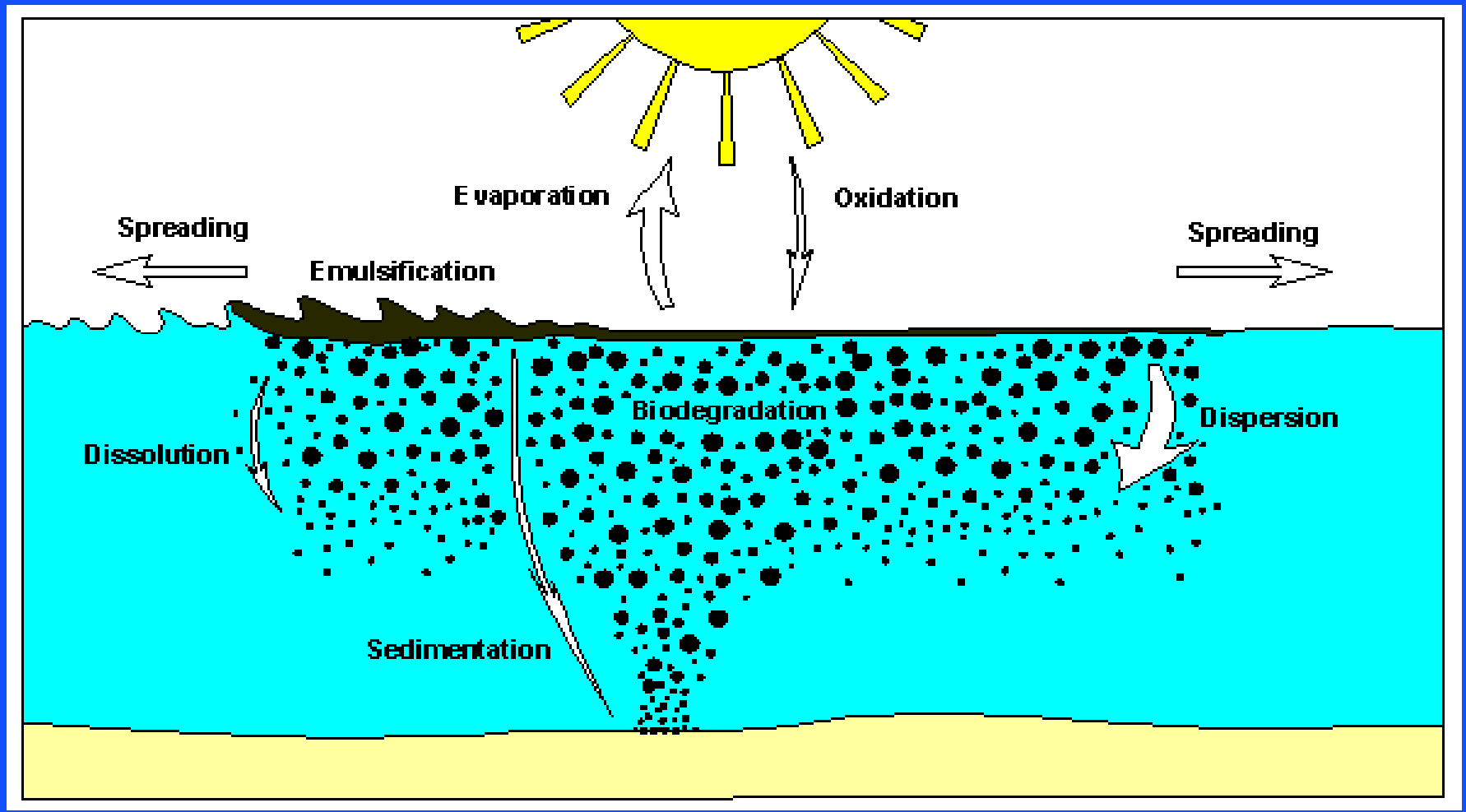
2) The 'Trigger' point is when there is "a threat of significant pollution" to the UK's pollution control zone, territorial waters or coastline;

3) Officers from Maritime and Coastguard Agency as a whole should play a much larger part in operations in response to a threat of significant pollution than has been the case in the past

4) Response to the threat of significant pollution from or involving an offshore installation, compatible with same from shipping casualty

Phases Of Response

- 1. Search And Rescue
- 2. Dealing with the casualty
- 3. Counter pollution at sea
- 4. Counter pollution on shore


Evaporation
Oxidation
Spreading
Spreading
Emulsification
Biodegradation
Dispersion
Dissolution
Sedimentation

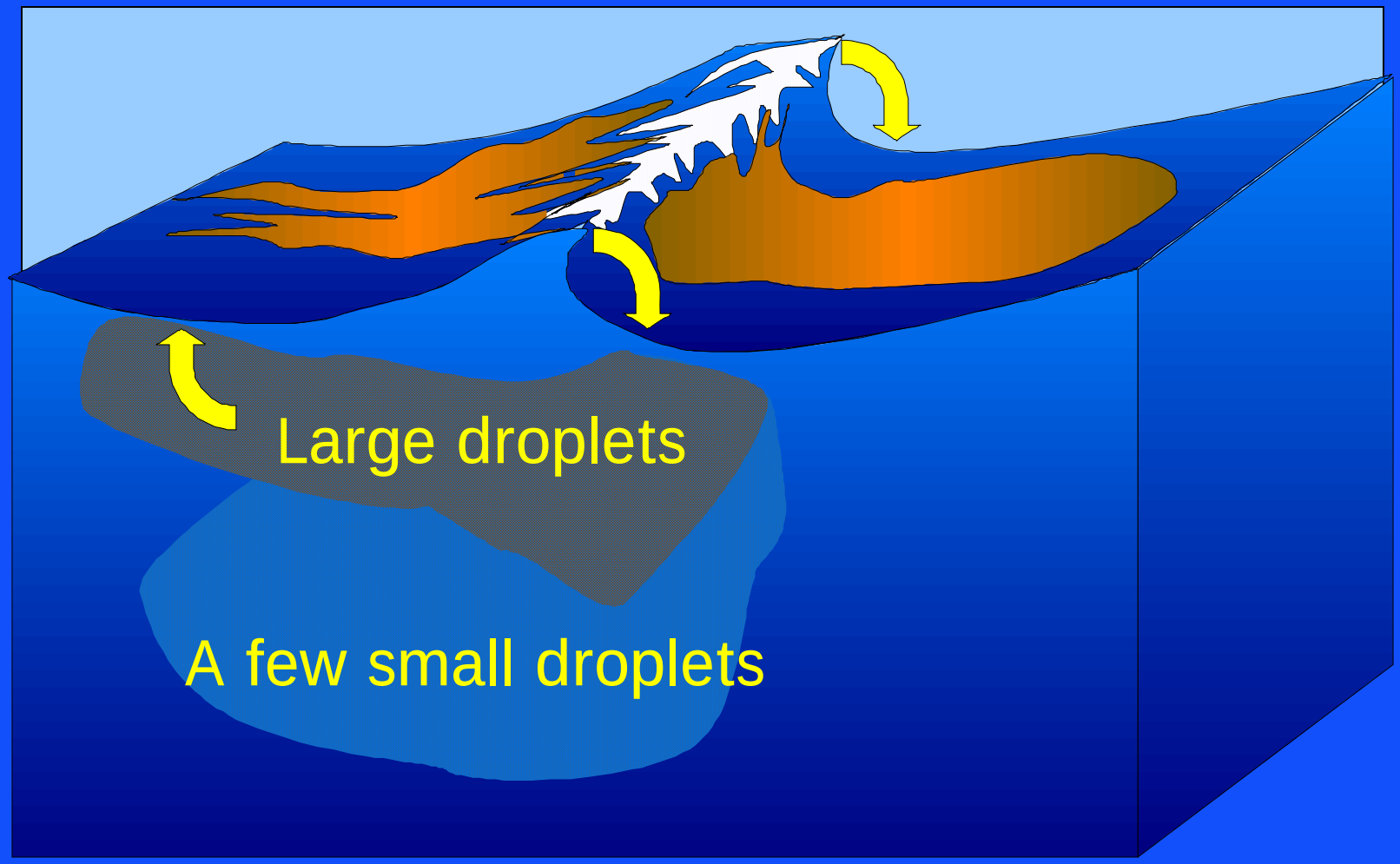
Known trends

- High viscosity oils are less dispersible than low viscosity oils
- Dispersants are more effective in rougher seas than in calm seas
- Higher dispersant treatment rates are more effective than lower treatment rates

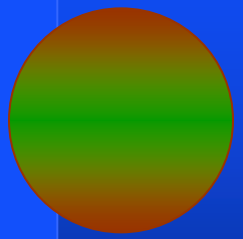
Potential for dispersant use

	Braer	Sea Empress	Erika Prestige
Oil Properties	Low viscosity	Low viscosity	**Very high viscosity**
Sea State	**Very rough**	**Rough to medium**	**Rough to medium**
Dispersant	**Partly needed**	**Worked very well**	**Would not work**

Effect of breaking wave on an oil slick



Why are small oil droplets so important ?



STOKES LAW

$$\Delta h / t = \frac{D^2(\rho_w - \rho_o)g}{18\eta_w}$$

Small droplets rise much more slowly than large droplets

The BENEFITS of dispersant use

- The successful use of oil spill dispersants will transfer spilled oil from the surface of the sea into the water column as fine oil droplets.

- Almost, but not all, of the dispersed oil will be biodegraded by naturally occurring organisms

- Dispersant use can be more rapid, more effective and less costly than other options

The RISKS of dispersant use

- Marine organisms will be exposed to elevated concentrations of dispersed oil.
- The consequences depend on degree of exposure(dispersed oil concentration and exposure time) and species affected
- There must be room (water volume) and time for dilution of dispersed oil to low levels

Dispersants

All products must be licensed & approved - Food & Environment Protection Act 1985

Approval not formally required if:

- **Above Mean High Water Springs**
- **Water depth less than 20 meters**
- **Or within one nautical mile of such area**

Always consultation if possible –Force Majeure

Licensing Authorities

Regional areas of the United Kingdom including:

**Department of Environment
for Rural Affairs**

**Scottish Executive for Environmental
& Rural Affairs**

Environment & Heritage Services

**"The approval and use of oil dispersants in the UK"
- Website, updated list of licensed dispersant products**

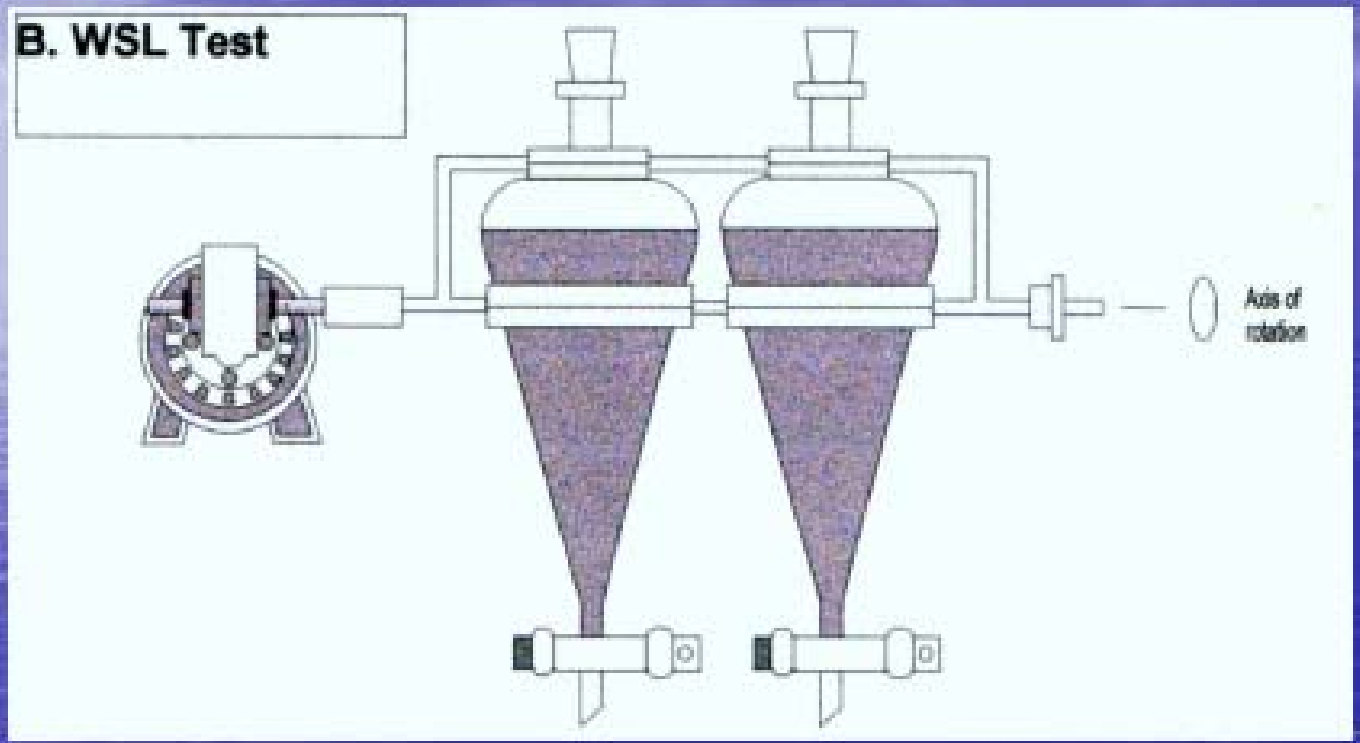
Approval of a dispersant product

Two main areas: Effectiveness & Toxicity

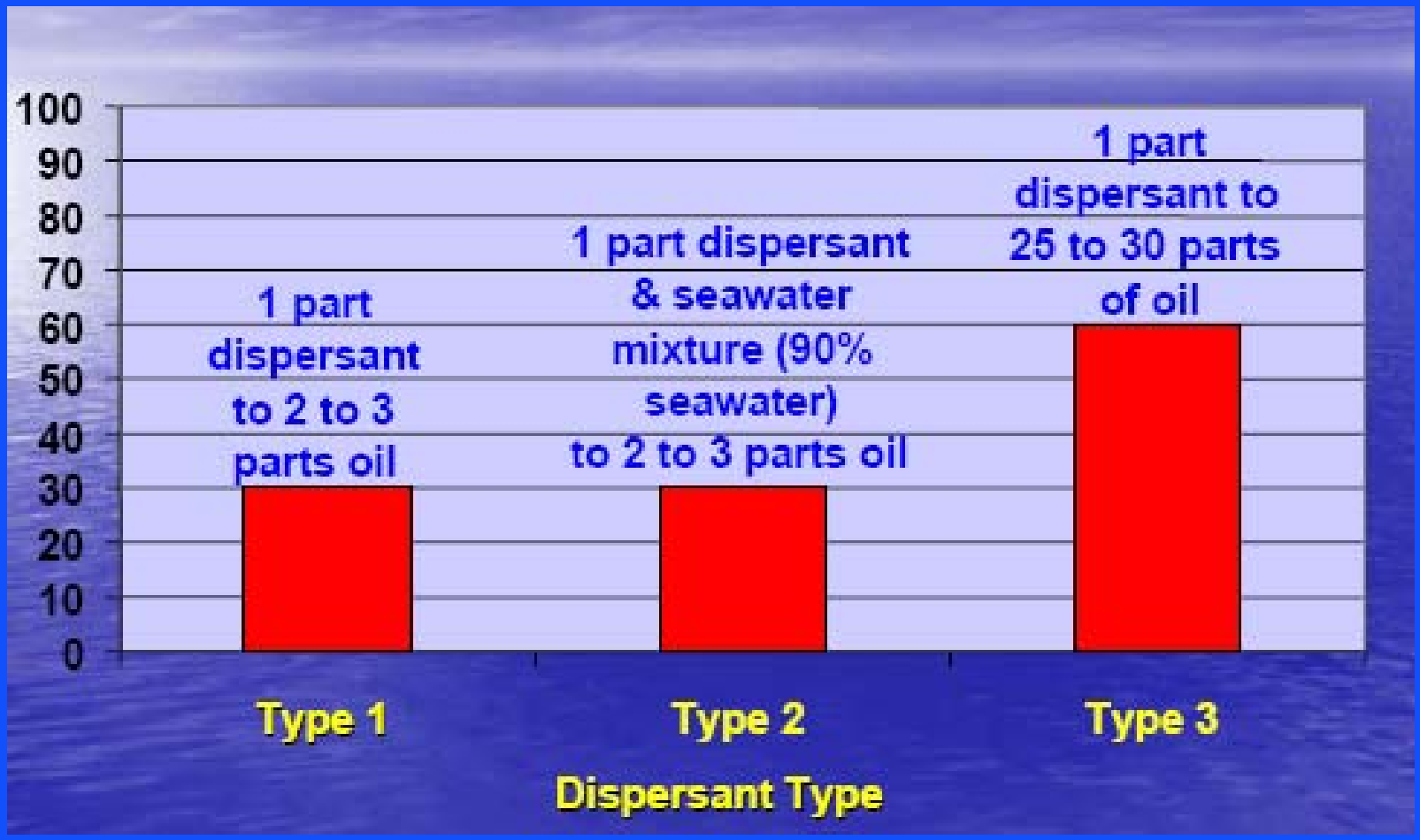
1. The dispersant's specifications & effectiveness

- Linked to Warren Spring Laboratory Report LR448
- aspects of appearance
- dynamic viscosity
- Flash point
- Cloud point
- Miscibility
- Efficiency WSL LR448 Appendix A, Annex 1

Testing for effectiveness



250 mls water + 5mls oil = 0.2 ml dispersant
Tumbled for 2 mins, allowed to stand for 1 min


100
90
80
70
60
50
40
30
20
10
0
1 part dispersant to 2 to 3 parts oil
1 part dispersant & seawater mixture (90% seawater) to 2 to 3 parts oil
1 part dispersant to 25 to 30 parts of oil
Type 1
Type 2
Type 3
Dispersant Type

Approval of a dispersant product

Two main areas:

2. Toxicity to marine species

Sea Test – ensures the relative toxicity of oil/dispersant mix is no greater than the toxicity of the oil alone
Brown Shrimp Crangon crangon

Rocky Shore Test – ensures the toxicity of dispersant alone is not greater than the toxicity of the oil alone
Common Limpet Patella Vulgata

Toxicity issues

- Modern dispersants are less toxic than the oil they are used to disperse
- Oil dispersed into the water column may cause toxic effects on some marine creatures
- Risk is very small if water is more than a few metres deep and if there is good water exchange
- Dispersants must only be used after careful consideration of consequences

Dispersant Testing

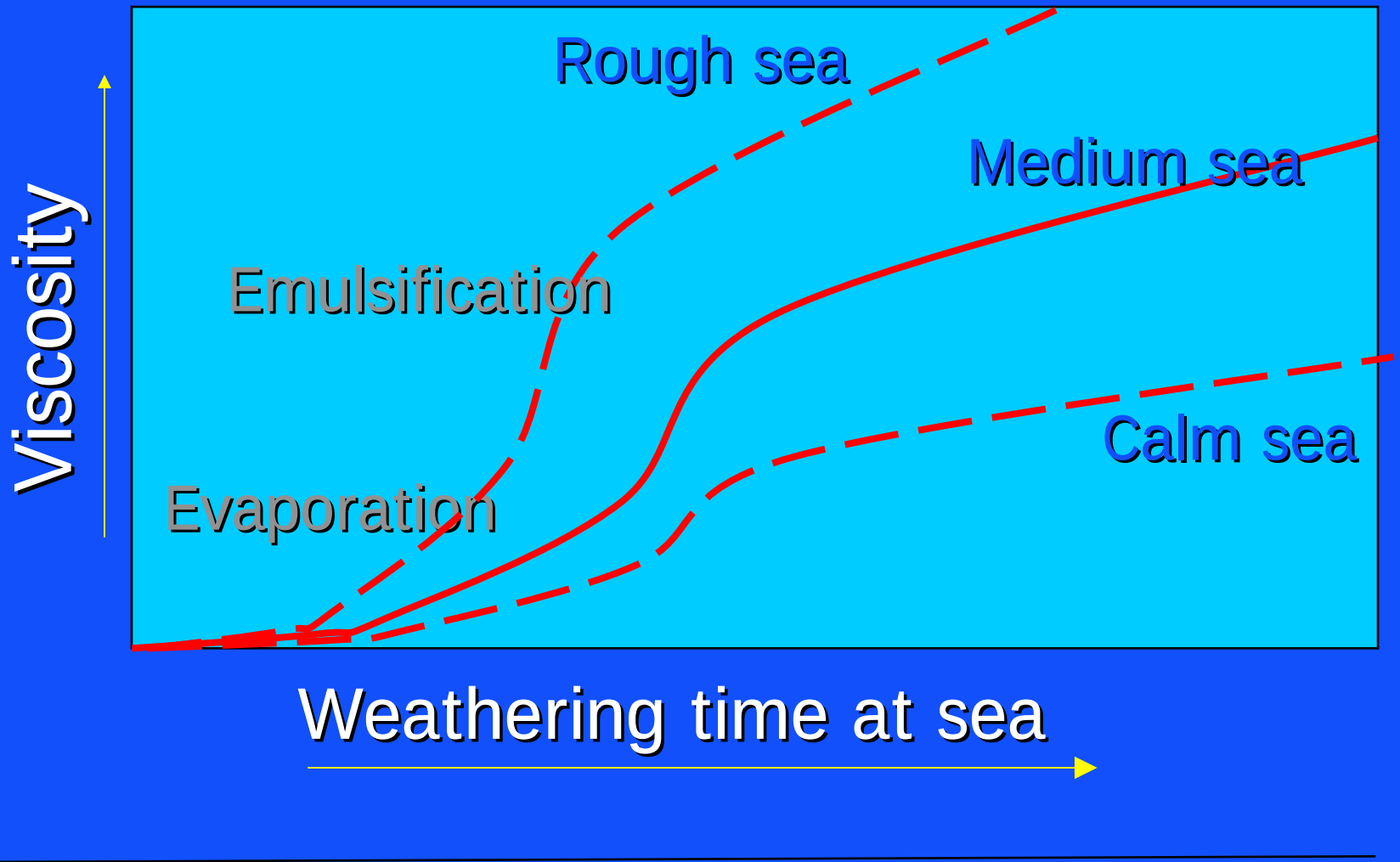
- Each different batch tested for efficiency after 10 years for product stored in its original sealed containers, 5 years if container has been opened, and at regular 5 year intervals thereafter.
- Only one sample per batch of dispersant needs to be tested in order to satisfy DEFRA's requirements. If the sample achieves the requisite 45% passmark, this is considered sufficient to validate the whole batch.

Contingency Planning

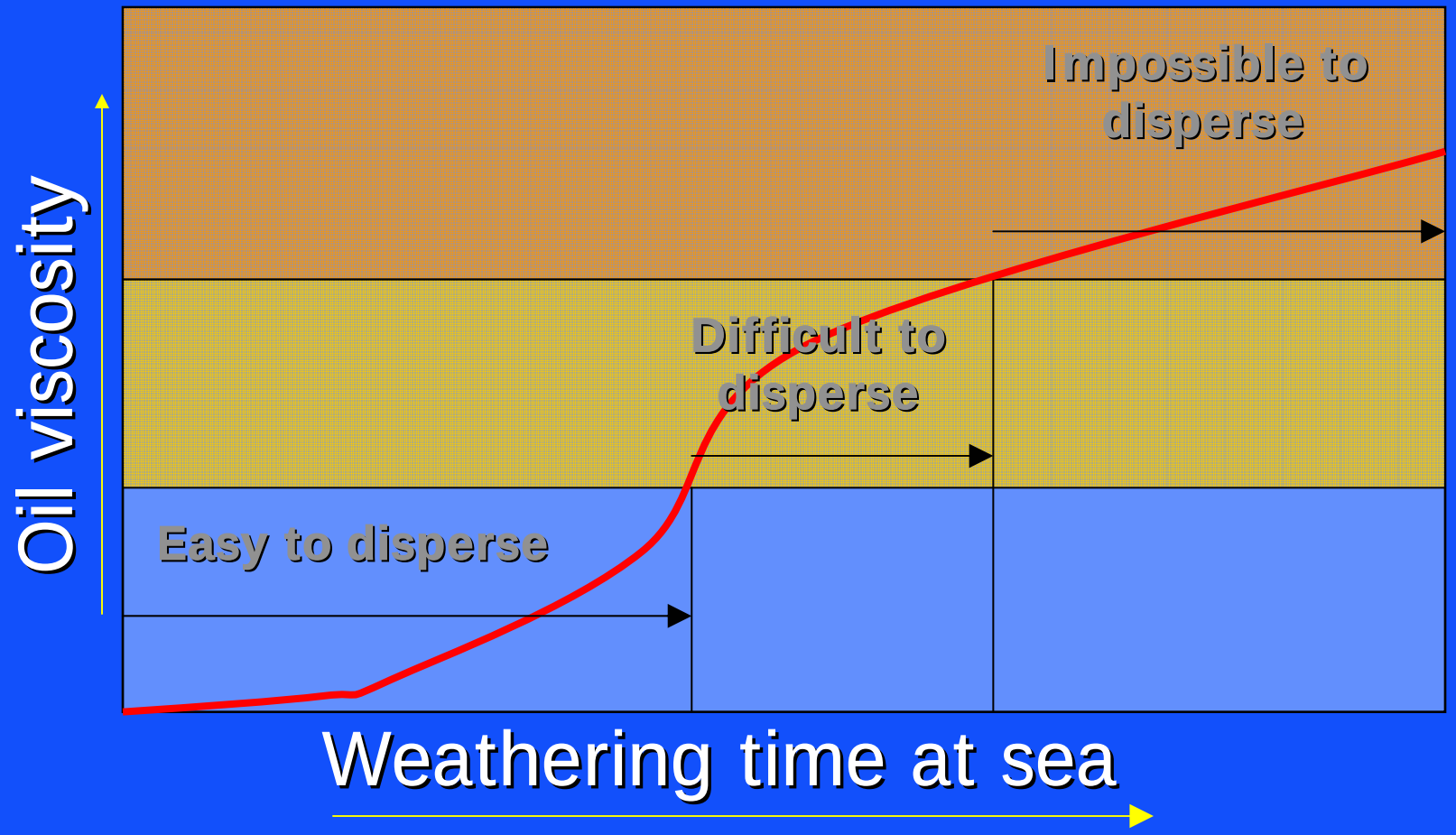
- The key to successful use of dispersants

- Oil Pollution, Preparedness, Response & Co-operation (OPRC)
- 761 ports and Harbours
- 200 required to have OPRC compliant oil plans
- Standing approval for dispersants
- Linked to sensitivity mapping and areas of use
- Estuarial plans – Humber, Forth, Bristol Channel

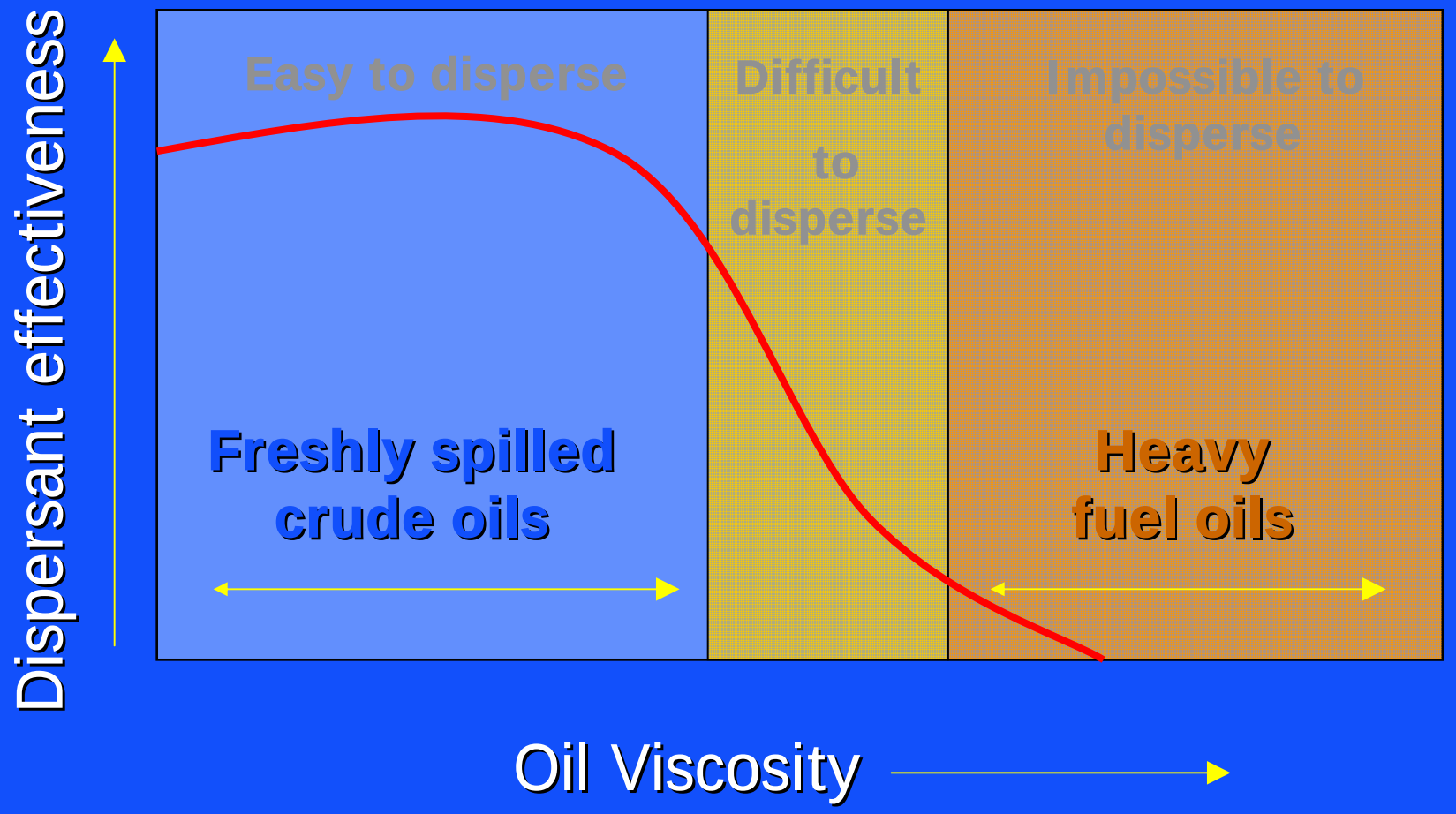
Change in crude oil viscosity with time at sea



Window of opportunity for dispersant use



Effect of oil viscosity on dispersant performance

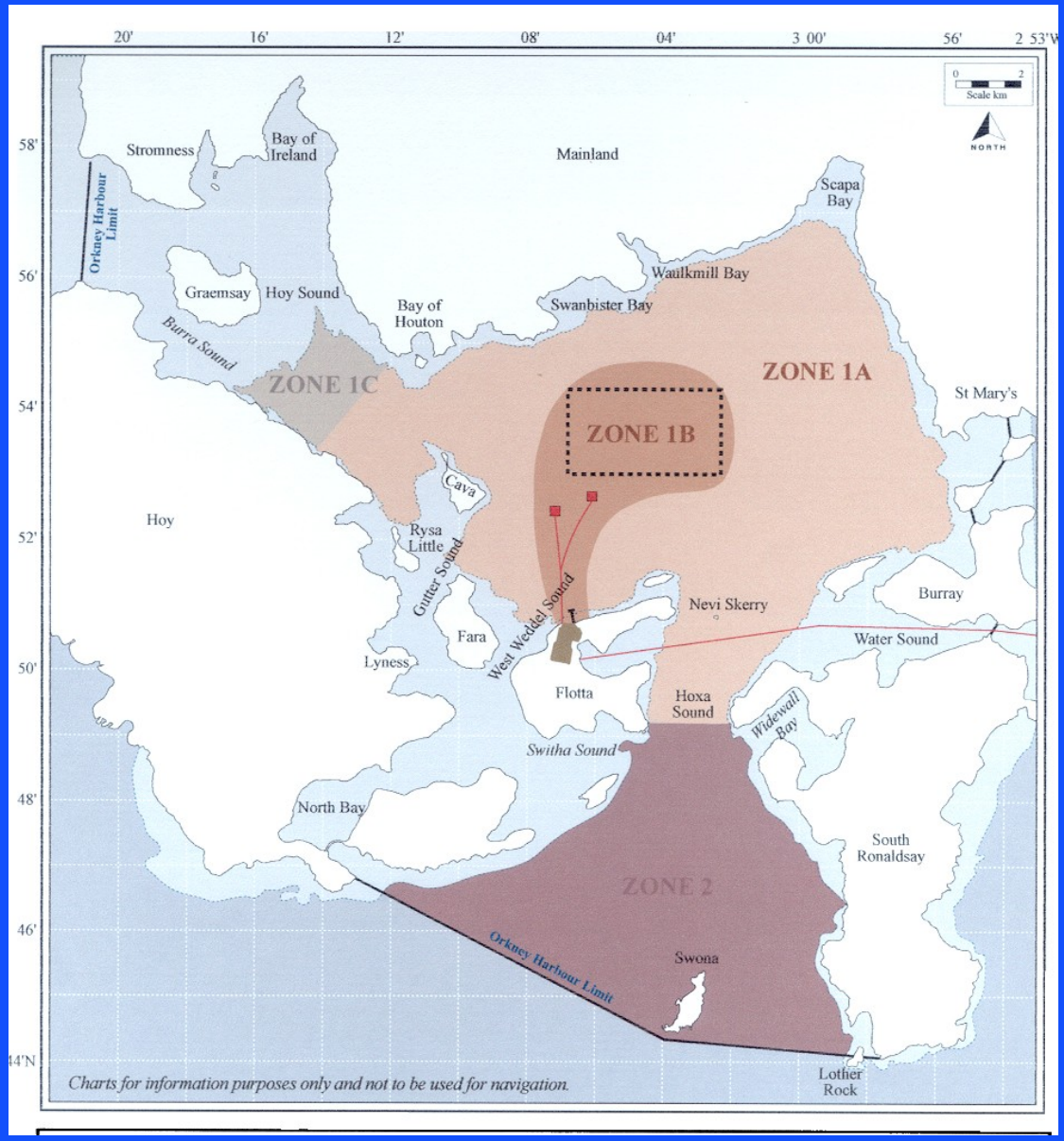


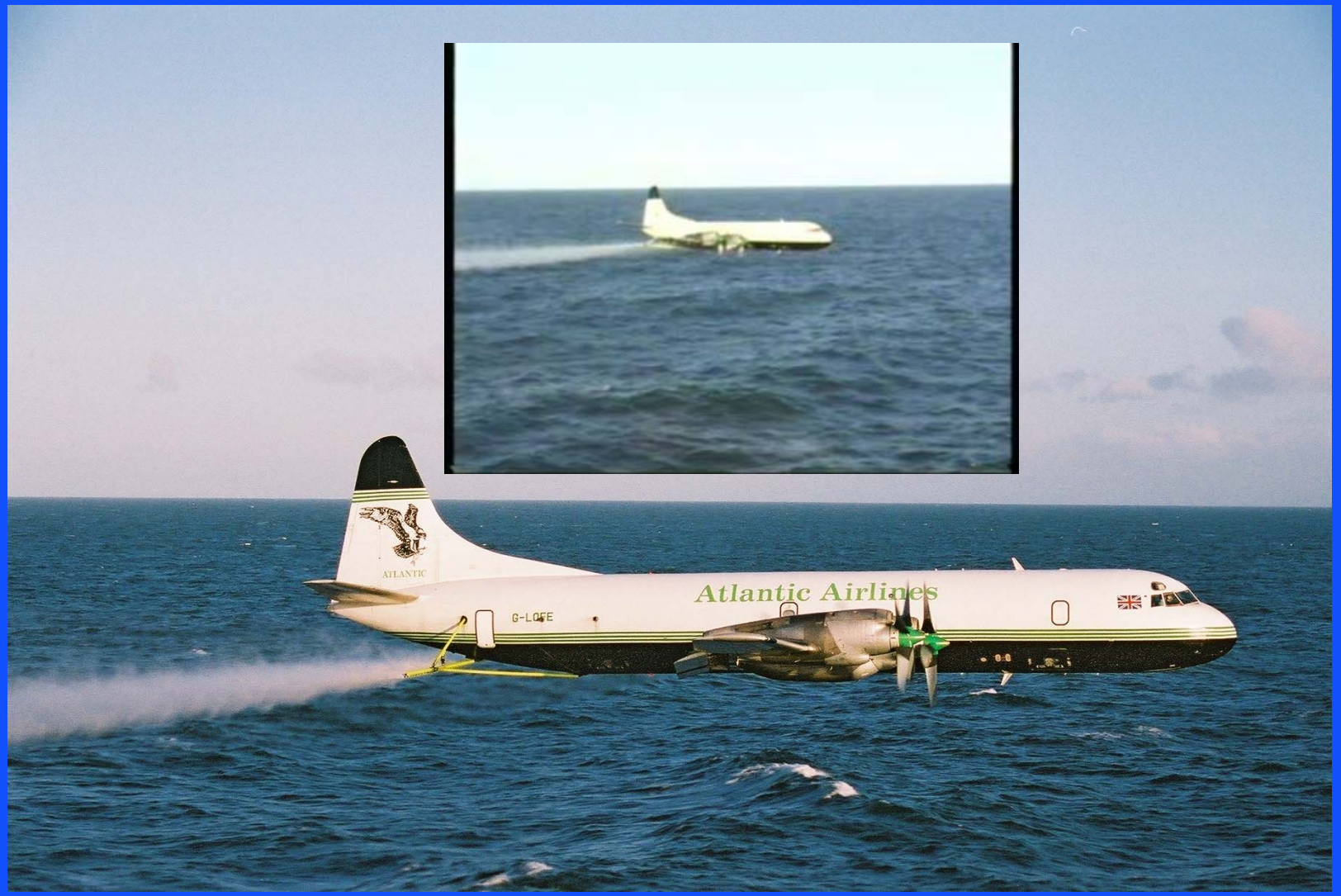
The “fish versus birds” debate

Dispersant use favours seabirds by reducing the amount of oil on sea surface

Dispersant use threatens fish by increasing the amount of dispersed oil

Standing Approvals




Atlantic Airlines
G-LOFE
ATLANTIC

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OSPR

MCA Dispersant Stockpiles

- MCA hold approximately 1400 tons of oil spill dispersant at 11 stockpiles around the UK
- 7 different types

Superdispersant 25	531
AGMA Superconcentrate DR379	406
Dasic Slickgone NS	217
Dasic Slickgone LTSW	110
Finasol OSR 51	73
Enersperse 1583	23
Corexit 9500	11
TOTAL	1371

The Response

HM Coastguard Rescue Centers

Initial assimilation

Counter Pollution & Salvage Officers on call

HQ Counter Pollution Support Teams

Agency Enforcement Team on call

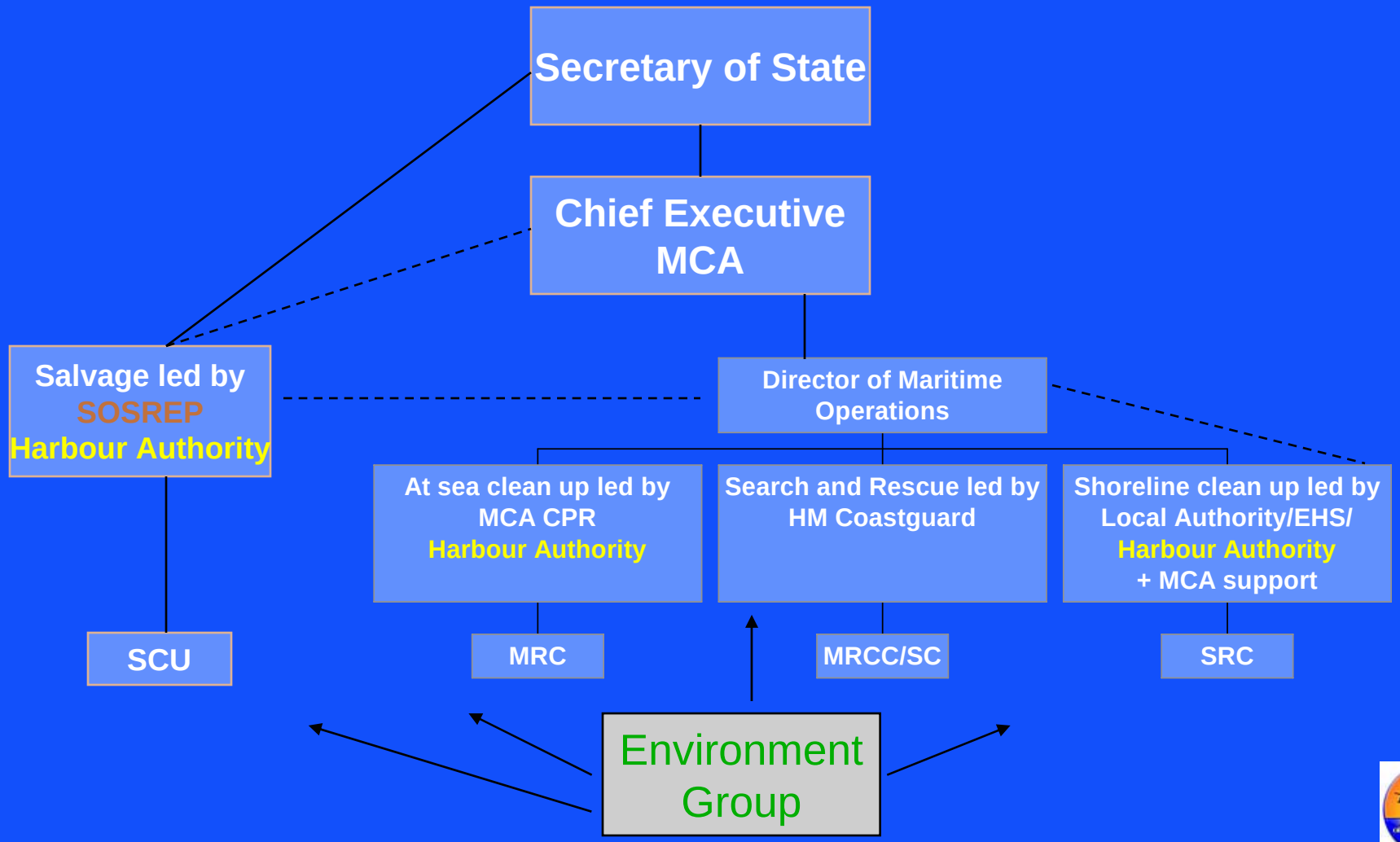
SOSREP on call

Surveyors on call

The SOSREP Function

- One person to act as representative of Secretary of State
- Cannot choose to ignore a situation
- Free to act without recourse to higher authority
- “Back or sack”

Command & Control



UK 2003 sea trials approach

- Many very small slicks (10 to 20 litres) to produce a matrix of many results
- Variables:
  - Oil viscosity (IFO-80,IFO-120,IFO-180,IFO-380)
  - Treatment rate (DORs of 1:25, 1:50. 1:100)
  - Dispersant (Agma DR379, Corexit 9500, Superdispersant 25)
- Known to produce a very wide variation in results in laboratory tests

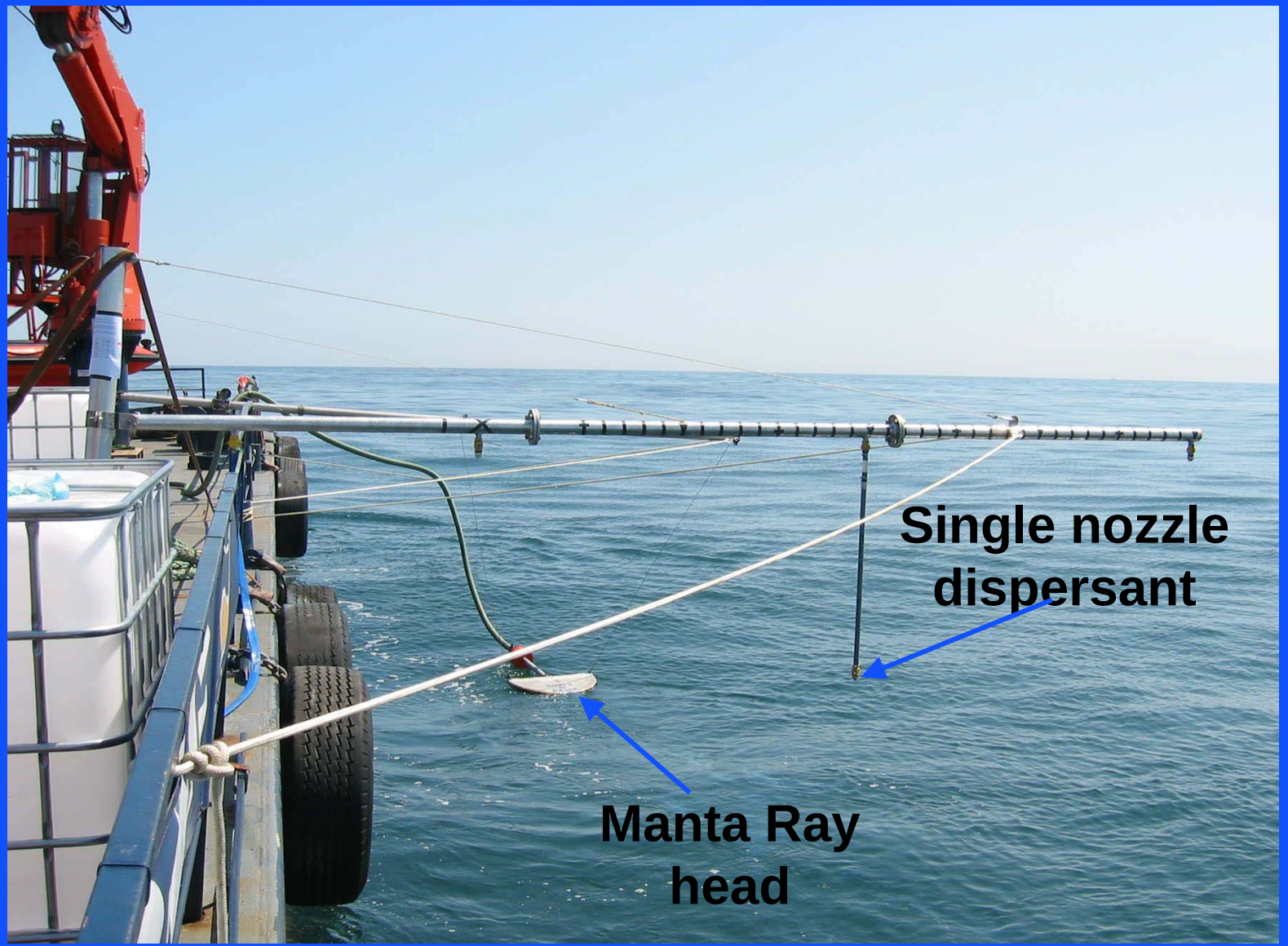
UK 2003 sea trial method

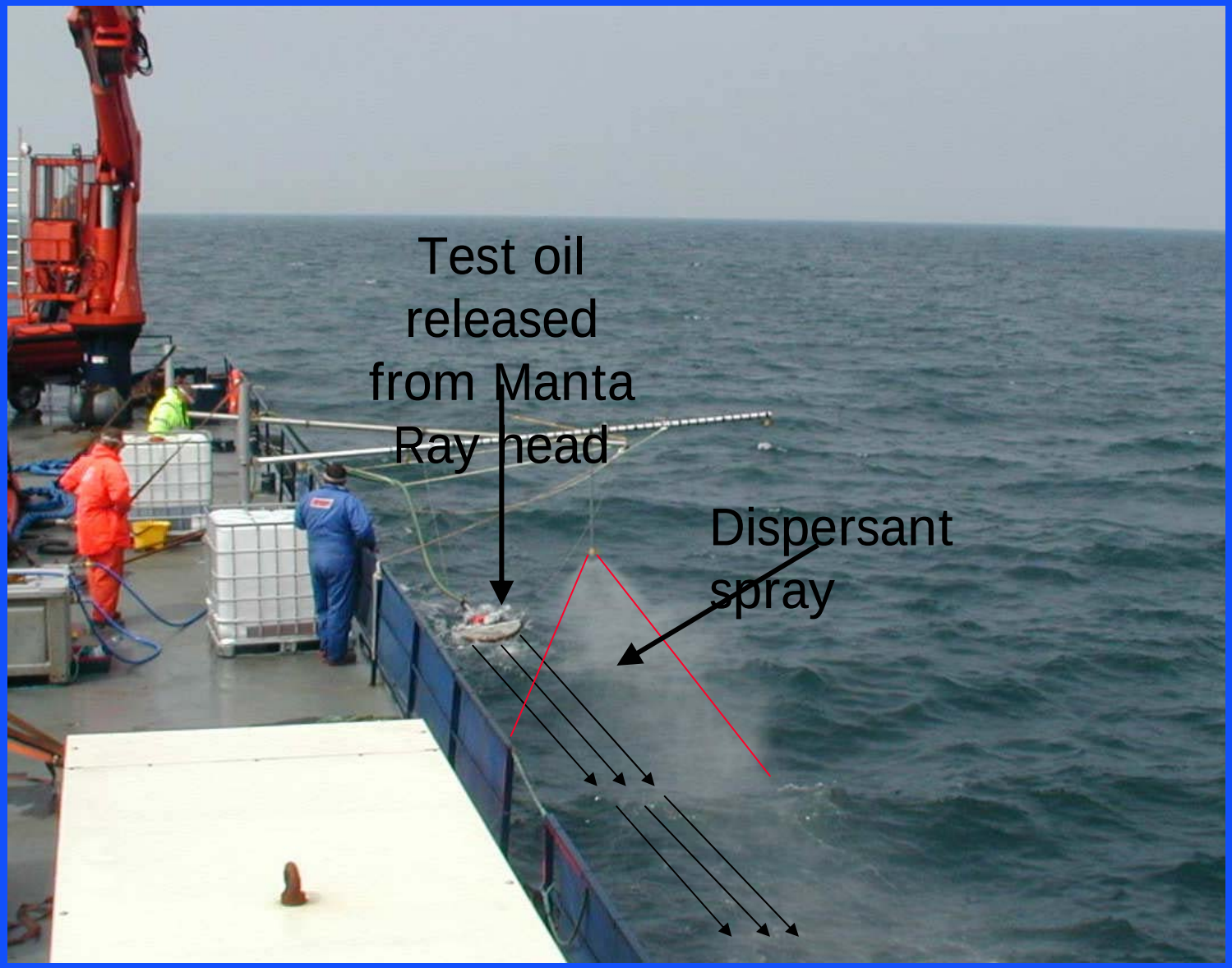
- ‘Carpet’ of test oil laid down from barge
- Almost immediately sprayed with dispersant at required treatment rate
  - No oil weathering / emulsification
- Visual assessment made by the expert panel after 2, 5 and 10 minutes

Assessing dispersant effectiveness

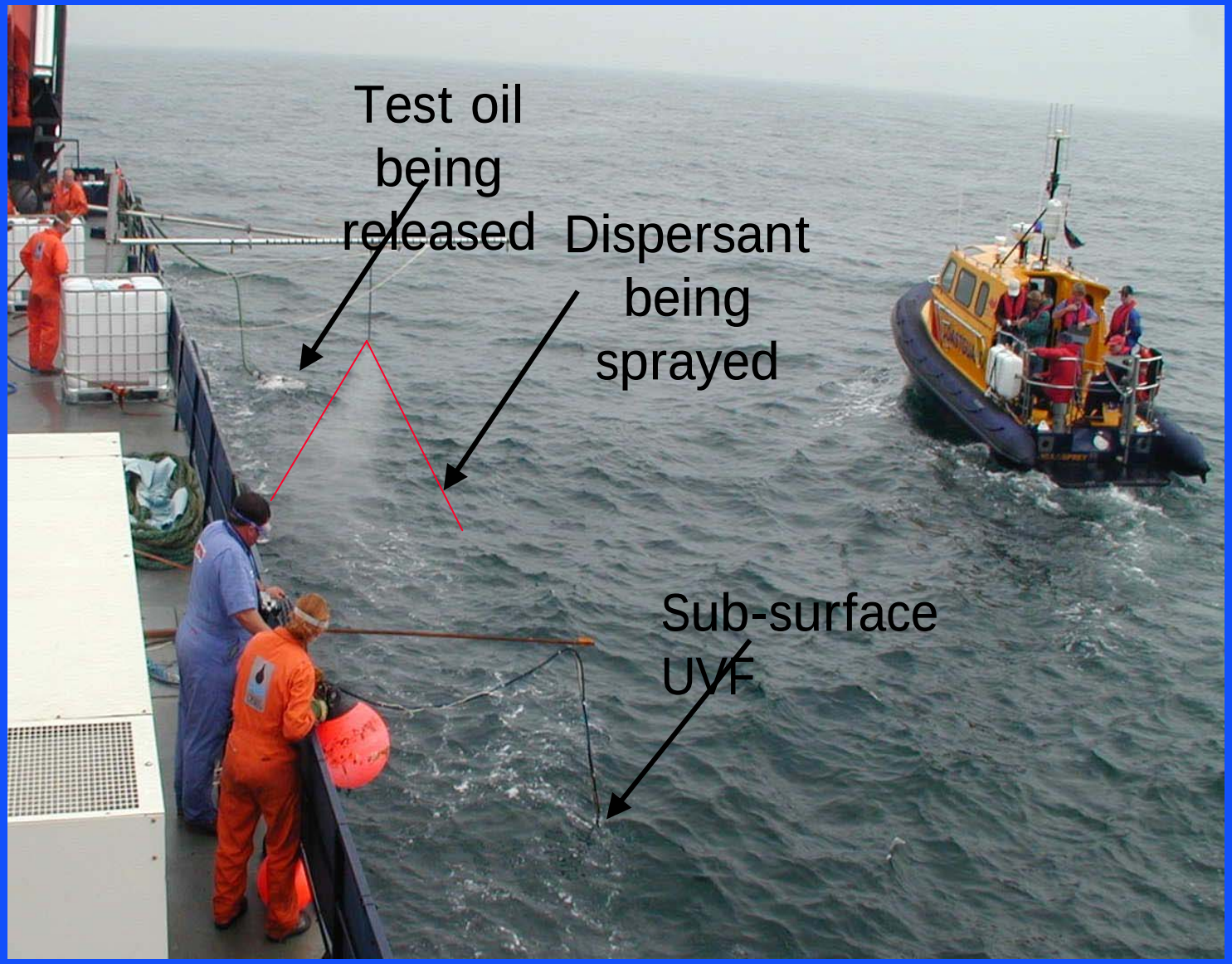
- A panel of experts used to visually (and independently) assess effect of dispersant on a simple ranking scale:
  1. No effect
  2. Slow or partial dispersion
  3. Moderately rapid dispersion
  4. Complete and rapid dispersion
- Coded random sequence of tests not known to observers

Willcarry – Williams Shipping barge


Single nozzle dispersant
Manta Ray head

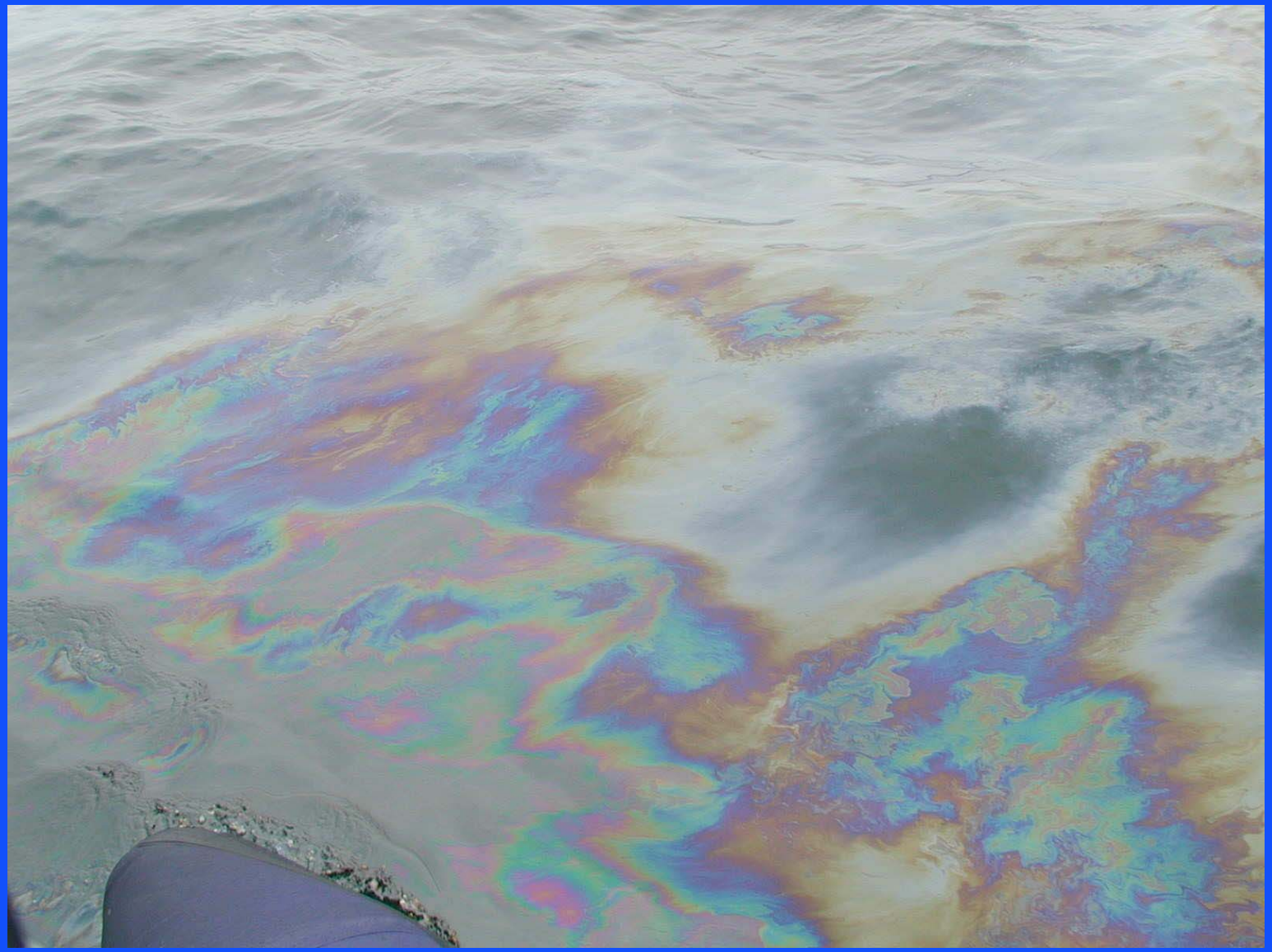

Test oil released from Manta Ray head
Dispersant spray

MCA Osprey – expert observers


Test oil being released
Dispersant being sprayed
Sub-surface UVF

Test oil on the water (not dispersing)

Sheen remaining after a lot of oil dispersed



Jo-Dan - carrying observers

Problems

- Intended 30 test scheduled programme to take 3 days; June 23rd, 24th and 25th
  - Monday 23rd June, 20 - 28 knot winds
  - Tuesday 24th June, less than 5 knot winds
  - Wednesday 25th June, 12 knots at 09:00, 20 knots at 12:00

A fishing trip, Tuesday 24th June

Lunch time, Wednesday 25th June

Questions

- Were observers consistent ?
- Were there differences between dispersants ?
- Did treatment rate make a difference ?
- Does oil viscosity make a difference ?

Conclusions of Trials

- The WSL threshold discriminating between effective and not effective dispersion needs revisiting and re-categorising

- IFO-180 fuel oil can be readily dispersed in summer sea temperatures around the UK with a wind speed in excess of 5 knots

- IFO-380 fuel oil may be dispersible at higher wind speeds than displayed during the sea trials. Some significant dispersion was visible during the trials. This may be feasible for wind speeds in excess of 20 knots

Modern oil spill dispersants capabilities

- Possibility of dispersing oils and oil residues having a viscosity of up to 7,000 cP at sea temperature
- Recent sea trial experiments very encouraging

- Possibility of breaking some emulsions that have a much higher viscosity

Current Research and Development

Review of UK Oil Spill Treatments Product Scheme

Application rates in UK Dispersant tests

- Product formulation creep
- Dispersion of oils away from rocky shore coastlines
- Multiple testing regimes

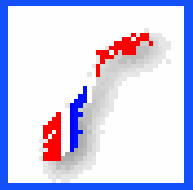
Ecological risks of chemically dispersing oils

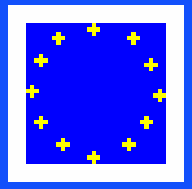
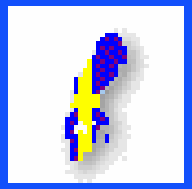
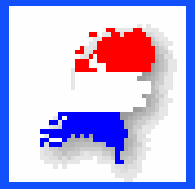
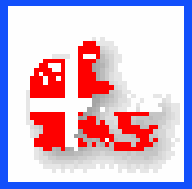
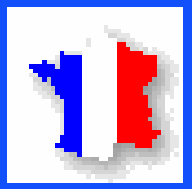
- MCA and Mineral Management Services
- Impact on mussels and amphipods noted
- Mostly able to recover, similar to just oil exposure

DEPOL 05 Sea Trials on HFO dispersion limit

- Monday 3rd October to Friday 7th October
- French Navy sea trials off Brest

Bonn Agreement

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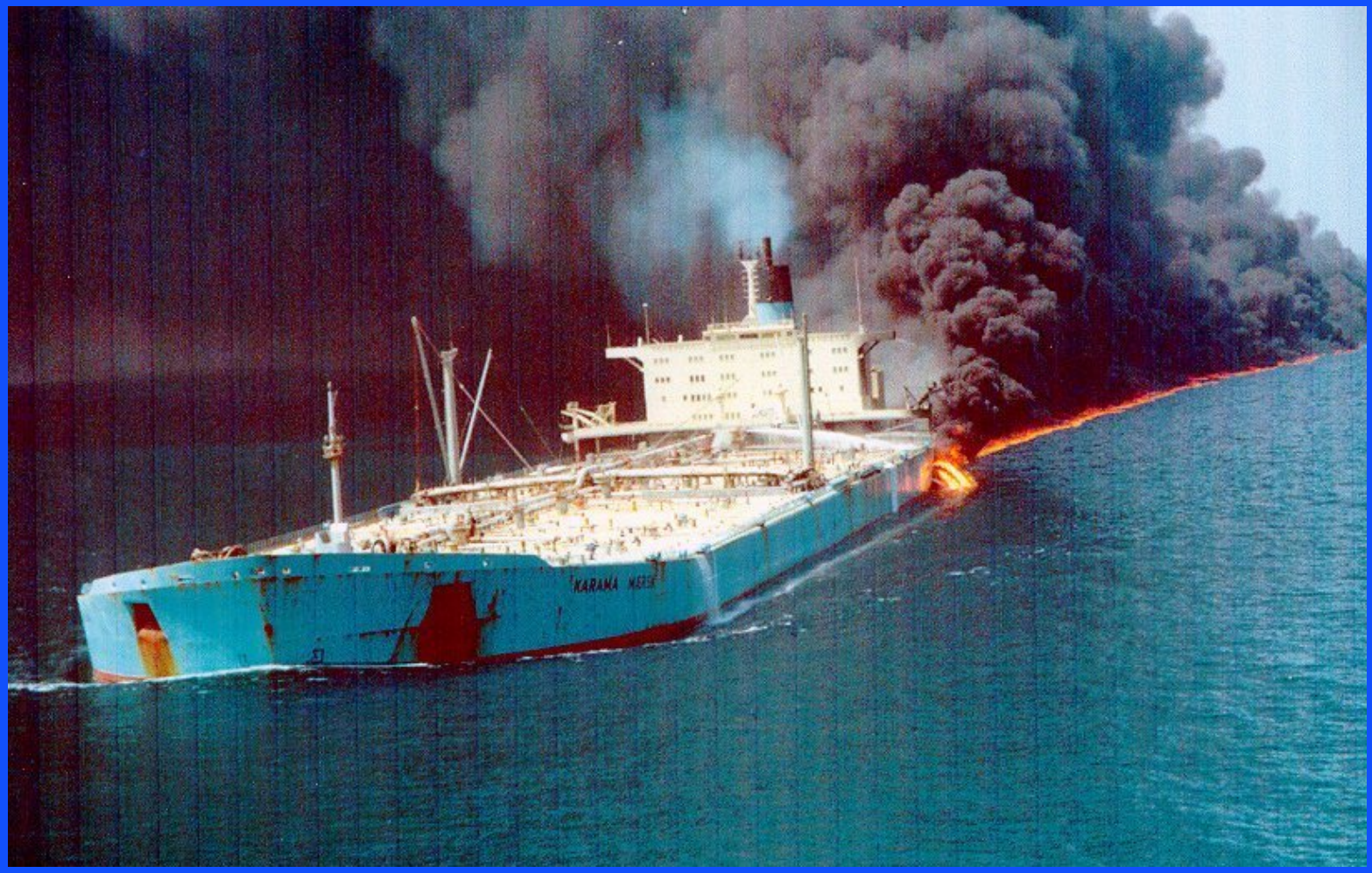
KARAMA

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CITA
TOBACCO
SHOES
And what have we got this time?!
LEGO
LEGO
TOKIO EXPRESS
RUM
26TH March, 1997.
André Ellis.
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THE CONTAINER SHIP 'CITA' SINKS OFF STMARY'S.